

1N-13070

NASA TECHNICAL MEMORANDUM

NASA TM-88463

CATALYSTS FOR THE DECOMPOSITION OF HYDRAZINE, HYDRAZINE

DERIVATIVES AND MIXTURES OF BOTH

(NASA-TM-88463) CATALYSIS FOR THE N86-28138
DECOMPOSITION OF HYDRAZINE, HYDRAZINE
DERIVATIVES AND MIXTURES OF BOTH (National
Aeronautics and Space Administration) 7 p Unclass
HC A02/MF A01 CSCL 07D G3/25 43350

R. Sasse

Translation of: "Katalysator, insbesondere zum Zersetzen von
Hydrazin, Hydrazinderivaten und Gemischen aus
beiden," West German Patent No. 2036958, Jan.
27, 1972, pp. 1-6

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546 JUNE 1986

STANDARD TITLE PAGE

1. Report No. NASA TM-88463	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle CATALYSTS FOR THE DECOMPOSITION OF HYDRAZINE, HYDRAZINE DERIVATIVES AND MIXTURES OF BORH		5. Report Date July 1986	
		6. Performing Organization Code	
7. Author(s) R. Sasse		8. Performing Organization Report No.	
		10. Work Unit No.	
9. Performing Organization Name and Address SCITRAN Box 5456 Santa Barbara, CA 93108		11. Contract or Grant No. NASA 4004	
		12. Type of Report and Period Covered Translation	
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, D.C. 20546		14. Sponsoring Agency Code	
13. Supplementary Notes Translation of: "Katalysator, insbesondere zum Zersetzen von Hydrazin, Hydrazinederivaten und Gemischen aus beiden," West German Patent No. 2036958, Jan. 27, 1972, pp. 1-6.			
16. Abstract This invention concerns a catalyst, in particular for the decomposition of hydrazine, hydrazine derivatives and mixtures of the two. The objective of this invention was to develop a catalyst of the type described that is cheap and easy to produce and is also characterized by extremely short response times.			
17. Key Words (Selected by Author(s))		18. Distribution Statement Unclassified and Unlimited	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 7	22. Price

Federal Republic of West Germany

German Patent Office

Explanatory text 2036958

File no.: P 20 36 958.8

Submitted: July 25, 1970

Published: Jan. 27, 1972

Description: Catalysts, in particular for the decomposition of hydrazine and hydrazine derivatives and mixtures of the two.

Submitted by: Messerschmidt-Boelkow-Blohm GmbH, 8000 Munich

Named as inventor: Sasse, Reinhard, 7106 Neuenstadt.

* Numbers in margin indicate foreign pagination

Catalysts, in particular for the decomposition of hydrazine, hydrazine derivatives and mixtures of the two.

This invention concerns a catalyst, in particular for the decomposition of hydrazine, hydrazine derivatives and mixtures of the two.

It is known that alloys of cobalt or nickel and aluminum are a suitable raw material for catalysts of the type mentioned at the outset. Sometimes an alkaline dissolving-out of the aluminum is required in order to obtain a chemically active structure for monergols of the afore-mentioned kind, with a large active surface. Catalysts of this kind are relatively inexpensive to produce, but in the cold state they have a long start time, so that it takes a long time until complete monergol decomposition takes place or until the full capacity of the catalyst is reached.

/3

This deficiency is not characteristic of the equally well-known precious metal catalysts. However, these are very expensive to produce. In addition, it is sometimes difficult to obtain the necessary precious metal on the world market in relatively large quantities and they may not be obtainable at all in times of crisis.

Thus the objective of this invention was to develop a catalyst of the type described that is cheap and easy to produce and is also characterized by extremely short response times.

According to this invention, this task was solved by using a base structure made from a poor heat conductor, such as asbestos or glass-fiber tissue, and coating it with oxides of iron and manganese, or with oxides of magnesium or other earth alkaline metals such as calcium, barium or strontium.

Since the production of this type of catalysts does not utilize raw materials whose availability may be limited, it is easy and inexpensive to manufacture. In addition, it has the advantage of good storage properties and extremely short response times.

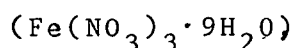
/4

Because of the latter advantage it can be used either alone or as a starting catalyst in combination with another catalyst of a similar type with a longer response time; it is excellent for the decomposition of hydrazine, hydrazine derivatives and mixtures of the two. The extremely favorable very short response time of this catalyst is the result mainly of:

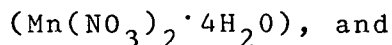
- a) the spontaneous decomposition of the afore-mentioned monergols by the catalytic action of the oxides of manganese and iron,
- b) the catalytic effect of the reduction products of the afore-mentioned metal oxides that provide for continuous monergol decomposition,
- c) the activating effect of the magnesium or earth alkali metal oxides in the oxide coating on the base structure, and
- d) the construction of the basic structure out of a poor heat conductor, which favors a rapid build-up and maintenance of the temperature in the oxide coating, which aids the monergol decomposition.

To manufacture the oxide coating for the base structure made of a poor heat conductor, the following are dissolved in water:

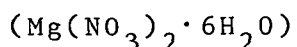
50 to 70% by weight iron-III nitrate



25 to 45% by weight manganese-II nitrate



5 to 10% by weight magnesium nitrate



and/or nitrates of earth alkali metals.

The base structure is immediately wetted with this aqueous solution. Of the many different possible forms of wetting, the one especially recommended in this case is dipping the base structure once or twice into the aqueous solution of the described composition; this dipping method produces an even oxide coating on the surface of the structure and it requires a small investment of apparatus and time.

/5

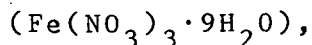
Another feature of this invention is that after wetting - in the case of one or several dippings into the aqueous solution, after one dipping or after each dipping - the base structure is exposed to a temperature of a minimum of about 400°C or a maximum of about 520°C . The advantage of this heat treatment in the temperature range cited is that the resulting conversion of the water-soluble nitrates of the metals mentioned causes spinels of the $\text{Fe}_2\text{O}_3 \cdot \text{MgO}$ type to form, between which the manganese oxide formed during the conversion is embedded. The spinels are reduced by reaction with hydrazine, hydrazine derivatives and mixtures of the two. Finely distributed magnesium oxide, iron and manganese remain on the surface of the structure, which guarantees continuous monergol decomposition.

Patent claims

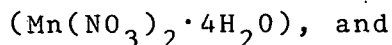
/6

1. Catalyst, in particular for the decomposition of hydrazine, hydrazine derivatives and mixtures of the two, characterized by a base structure made of a poor heat conductor, such as asbestos or glass fiber tissue, which is coated with oxides of iron and manganese or with oxides of magnesium or earth alkali metals such as calcium, barium or strontium.
2. Catalyst according to claim 1, characterized by the fact that, to make the oxide coating on the base structure, the following are dissolved in water:

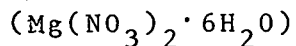
50 to 70% by weight iron-III nitrate



25 to 45% by weight manganese-II nitrate



5 to 10% by weight magnesium nitrate



and/or a nitrate of earth alkali metals,

and the base structure is wetted with this aqueous solution.

/7

3. Catalyst according to claims 1 and 2, characterized by the fact that the base structure is dipped one or several times into the aqueous solution prepared according to claim 2 and after dipping, or after each dipping, it is exposed to a minimum temperature of about 400°C and a maximum temperature of about 520°C.